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# GEOLOGICAL REPORT ON THE NINA PROPERTY
NICA 1-2, OMI 1, 2, 3, 4, 4FR CLAIMS
GERMANSEN LANDING, B.C.

LATITUDE 55 58'N
LONGITUDE 124 47'W
NTC 93N/15



OMINECA MINING DIVISION

for

EQUINOX RESOURCES LTD.

and

DAREN RESOURCES LTD.

(Equinox-Daren Joint Venture)



by

D.G. Leighton, B.Sc., F.G.A.C.

15 JANUARY, 1988

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## 1. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Nina Property is a lead-zinc-silver-germanium prospect located in north central British Columbia. It consists of seven claims (72 units) and one fractional claim owned by Equinox Resources Ltd. and for which Daren Resources Ltd. has an option to earn a 50% interest (Equinox-Daren Joint Venture). The property is underlain by a well bedded sequence of carbonate strata of late Silurian to Middle Devonian age - a rock package commonly referred to as the "Omineca Limestone Belt". Work carried out on the property has included geological, geochemical and geophysical surveys as well as trenching done at intervals since the 1920's.

Mineralization consists of numerous low grade stratabound lead-zinc showings located within brecciated and dolomitized limestones. One showing returned assays averaging 5% zinc and 1.3 ounces silver per ton across six meters while at another location a two meter sample assayed 25% lead and 3 ounces silver per ton. Zinc occurs as the mineral sphalerite which itself contains more than 0.05% germanium on average. This is a very high germanium content which, as a price of about $1000 per kilogram, makes it a key economic commodity. No drilling has yet been carried out in the Nina Lake area so the tonnage potential of this exploration target remains to be tested.

Smelters consider anything over 0.02% (200 ppm) germanium of distinct economic interest as a by-product in zinc ore. Assuming a value of $1000/kg, 0.05% germanium content in zinc would add about $500 per ton to the gross value of any sphalerite in a concentrate. This has the potential to elevate currently defined zinc grades to economic levels on the Nina property.

Excellent potential exists for delineating ore reserves by drilling down dip extensions of "exposed" mineralization on the Nina Property. A program is therefore recommended to test for extensions of mineralized zones in the Nina Lake area and to drill existing mineralization to determine grades and tonnage. It is recommended that $100,000 be allocated for a Stage I drilling program and, contingent on successful results, $250,000 for a Stage II drilling program.

## 2. INTRODUCTION

In early 1986, Beaty Geological Ltd. identified lead-zinc-silver mineralization located in the vicinity of Nina Lake near Germansen Landing, B.C. as a prospect with previously unrecognized potential to be a significant germanium source. Follow-up work in the fall showed that the germanium is associated mainly with sphalerite. Furthermore, in concentrate form, the zinc mineralization seems to consistently carry economic values of germanium metal. Work in this area by Cominco Ltd. in the early 1970's has identified the geologic setting and mineralization controls, and extensive trenching at that time delineated several heavily mineralized structures.

This report summarizes the results of work programs completed at Nina Lake to date and includes recommendations for further work. This should include delineating lead-zinc-germanium ore by drilling down dip extensions to surface exposures, and examining other targets with exploration potential.

## 3. LOCATION AND ACCESS

The Nina property is located 20 km northwest of Germansen Landing in north central British Columbia. Geographically the claim block is centered at 55° 58' north latitude, 124° 47' west longitude (N.T.S. map-sheet 93N/15). Elevations on the property range between 900 and 1500 meters a.s.l. Vegetation varies according to elevation and slope, and is in general heavily forested with fir and pine.

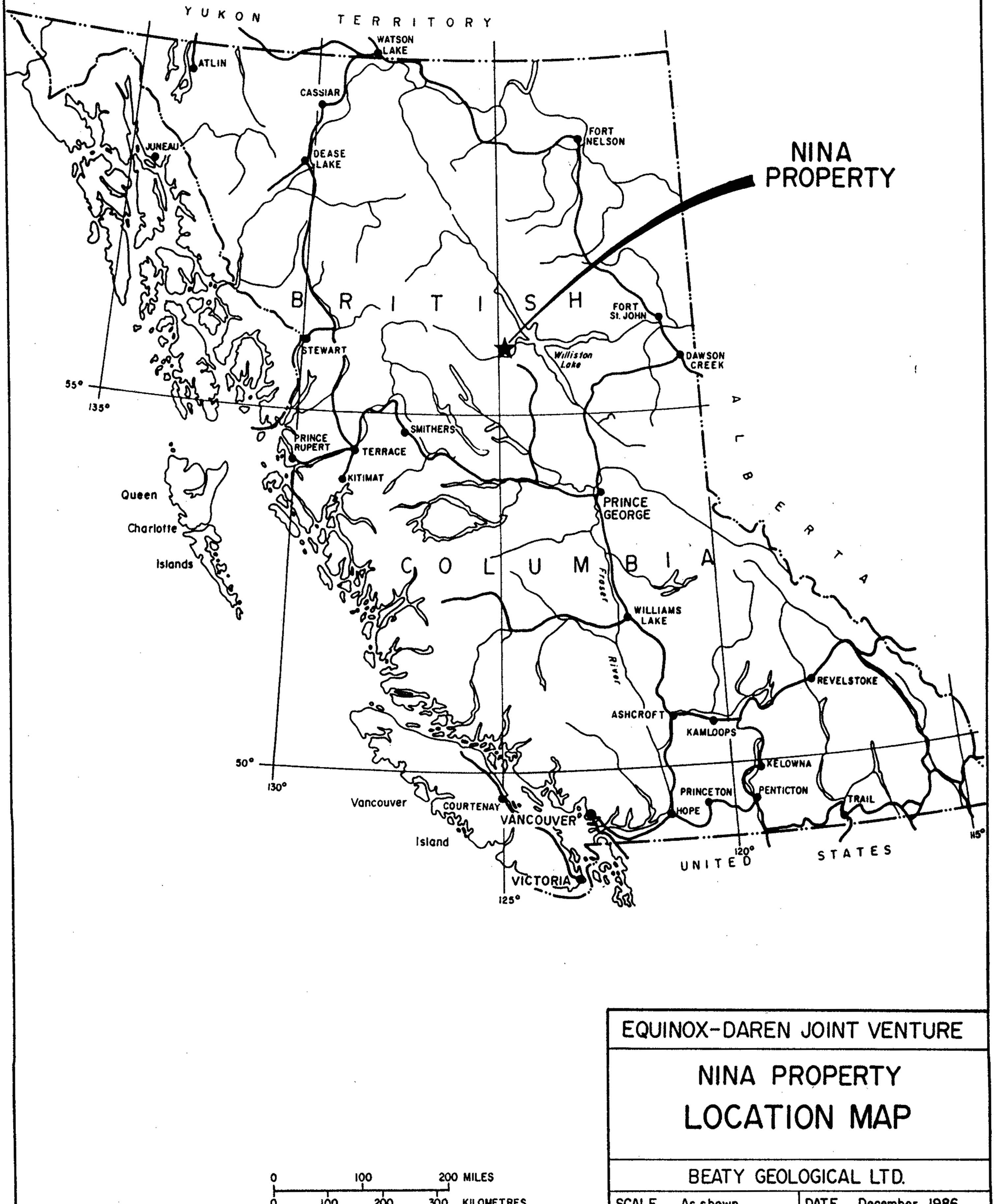
Access is via a four-wheel drive road past Nina Lake from the Germansen-Omineca Road. Figure 1 shows the Nina property relative to key topographic features.

## 4. ACKNOWLEDGEMENTS

The writers would like to acknowledge the data provided by others which has assisted immensely in the evaluation of the Nina Lake area. We are particularly grateful to Bruce Mawer of Cominco Ltd. and Dr. J.W.A. Monger of the Geological Survey of Canada. Both Cominco and G.S.C. data have been freely incorporated into this report.

## 5. HISTORY

Exploration activity in the Omineca Limestone Belt began in the 1920's. Many showings have since been found and most have been sporadically worked to the present. Much of the work prior to the early 1950's consisted of prospecting plus




| | |
|---|---|
| EQUINOX-DAREN JOINT VENTURE | |
| NINA PROPERTY<br>LOCATION MAP | |
| BEATY GEOLOGICAL LTD. | |
| SCALE. As shown | DATE. December, 1986 |
| DRAWN. L.S.M., J.W. | FIGURE No. 1. |

hand and hydraulic trenching. Though various claims were held by several companies and individuals no significant work was carried out until 1973 when large ground positions were acquired by Cominco, Canex-Placer, Imperial Oil and others. This activity was initiated by the Geological Survey of Canada (Monger and Paterson, 1974) following a remapping of the region. The G.S.C. work showed that mineralized carbonates located in the vicinity of Nina Lake were Middle Devonian in age rather than Permian or Cambrian (Cache Creek Group) as previously thought, and thus a more favourable host rock. With a view to the possibility of developing low grade, large tonnage open pit ore a concentrated exploration effort was undertaken especially by Cominco. Work done included extensive geochemical sampling and geological mapping, followed by road access construction and bulldozer trenching. With declining zinc prices interest was gradually lost and the claims were allowed to lapse.

## 6. PROPERTY

The Nina property consists of seven full size mineral claims and one fractional claim as shown on Figure 2. These are located in the Omineca Mining Division:

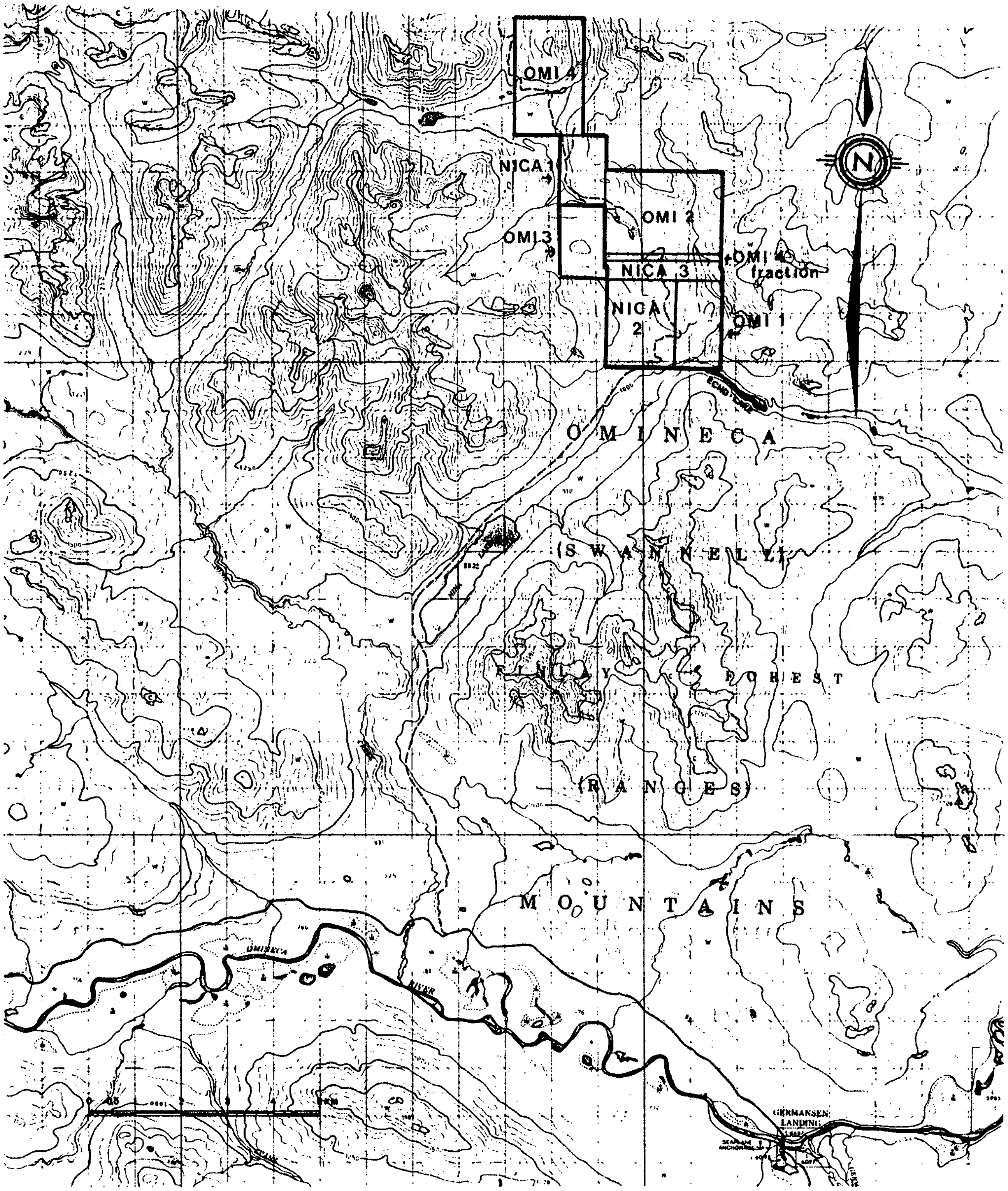
| Claim (Units) | Record No. | Record Date | Expiry |
|---|---|---|---|
| Nica 1 ( 6) | 7969 | 7 Oct. 1986 | 7 Oct. 1989 |
| Nica 2 (12) | 7970 | 7 Oct. 1986 | 7 Oct. 1989 |
| Nica 3 ( 5) | 8976 | 15 Sep. 1987 | 14 Sep. 1990 |
| Omi 1 ( 8) | 8089 | 18 Dec. 1986 | 18 Dec. 1989 |
| Omi 2 (20) | 8090 | 19 Dec. 1986 | 19 Dec. 1989 |
| Omi 4 (15) | 8091 | 19 Dec. 1986 | 19 Dec. 1989 |
| Omi 4 fr. | 8092 | 18 Dec. 1986 | 18 Dec. 1989 |
| Omi 3 ( 6) | 8727 | 28 Aug. 1987 | 28 Aug. 1990 |

The above claims are registered in the name of Equinox Resources Ltd.

## 7. GEOLOGY

### 7.1 Regional

The Nina property is located near the center of the so called "Omineca Limestone Belt". This refers to a linear zone of sediments about 12 kilometers wide and 175 kilometers long which runs between Johansen Lake in the




EQUINOX-DAREN JOINT VENTURE

NINA PROPERTY

CLAIM MAP

BEATY GEOLOGICAL LTD.

| | |
|---|---|
| SCALE 1:125,000 | DATE DECEMBER, 1986 |
| DRAWN LSM, SJ | DRAWING No. FIGURE 2 |

north and Manson Lake to the south. On the east it is bounded by a Proterozoic metamorphic complex. The western edge is covered by Triassic volcanics.

The "Omineca Limestone Belt" is a well bedded sequence of carbonate strata about 300 meters thick. These rocks were subdivided (Monger and Paterson, 1974) into the following five subdivisions from oldest to youngest.

1. Sheared, light grey, locally argillaceous, fine grained limestones including some dolomite.

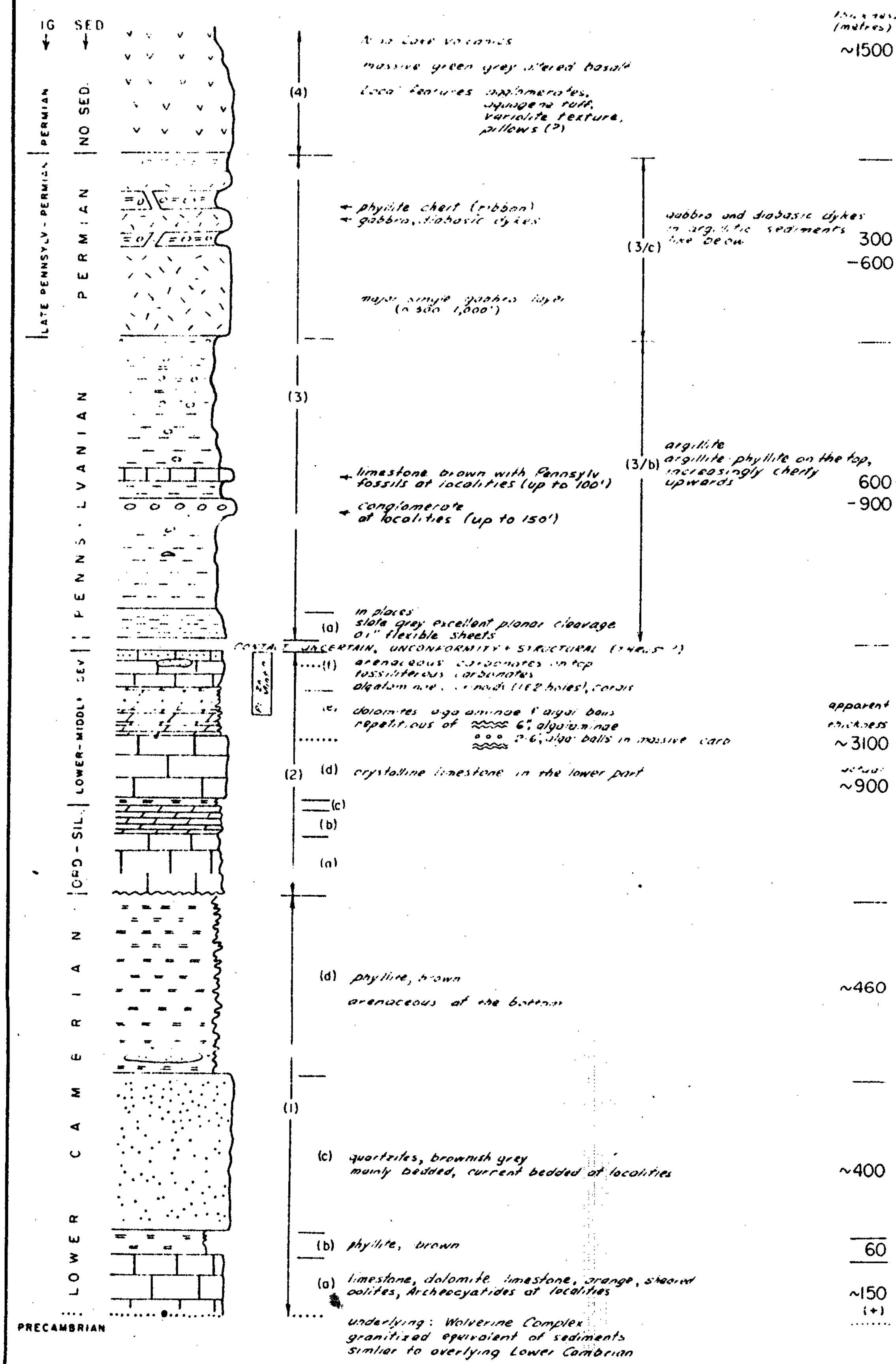
2. Thin bedded, black dolomite and dolomitic limestone about 60 m thick.

3. Brown to dark grey calcareous phyllite and slaty phyllite about 25 m thick.

4. Dark grey and grey, laminated, fetid dolomite interbedded with repeating units of light grey, fairly massive dolomite containing algal balls with concentric structure from 1 to 2 cm, and dark grey algalaminate dolomite containing rings filled with white crystalline dolomite. The massive beds are from 1 to 2 m thick, whereas the algalaminate beds average about 120 m.

5. Dark grey crinoidal dolomite and sandy dolomite, possibly about 100 m thick, contains crinoid columns with twin axial canals. The sandy dolomite contains scattered quartz grains, possibly of windblown origin, in the dolomite matrix.

Figure 3 is an idealized stratigraphic section. The sequence resembles structures of Late Silurian to Middle Devonian age located in the McDame area to the northwest in the Cassiar Mountains. It is unit E which is host to lead-zinc mineralization. The ages of rock units within this belt vary from Upper Triassic slates and greenstones in the vicinity of Manson Creek through Ordovician to Middle Devonian carbonates (with overlying Permo-Pennsylvanian shales and volcanics) in the Nina Lake area to the Middle Pennsylvanian carbonates, cherts, phyllites, conglomerates and volcanics in the Lay Range to the north. The general geology of the Nina property area is shown on Figure 5 (in pocket). This map shows the main rock contacts and structural features. Nina Lake area strata form a homoclinal succession, interrupted by faulting and folding that dips westward from the high grade metamorphic axis of the Wolverine Volcanic Complex.




EQUINOX-DAREN JOINT VENTURE

# NINA PROPERTY IDEALIZED STRATIGRAPHIC SECTION

BEATY GEOLOGICAL LTD.

| | |
|---|---|
| SCALE 1cm = 150m | DATE December, 1986 |
| DRAWN L.S.M, J.W | FIGURE No. 3 |

NOTE

MAP MODIFIED FROM DATA PROVIDED BY COMINCO LTD. AND OTHERS

## 7.2 Mineralization

Mineralized showings in the vicinity of Nina Lake (see Figure 5) generally occur as semi-continuous zones within a relatively narrow part of the Middle Devonian stratigraphy. While the average grade is low (averaging 3-4% lead-zinc), locally high grade areas have developed. The sulphides are mainly stratabound but the main localizing factor is moderate scale faulting.

The zinc occurs primarily as orange sphalerite. Local high grade lenses occur in relatively wide fault zones. Trace amounts of yellow sphalerite have been observed as a late stage vein material associated with quartz and barite. Galena is very sporadic. Two areas contain sufficiently well developed mineral showings to merit drilling: the Biddy-Jemima and West Vernon areas as described below.

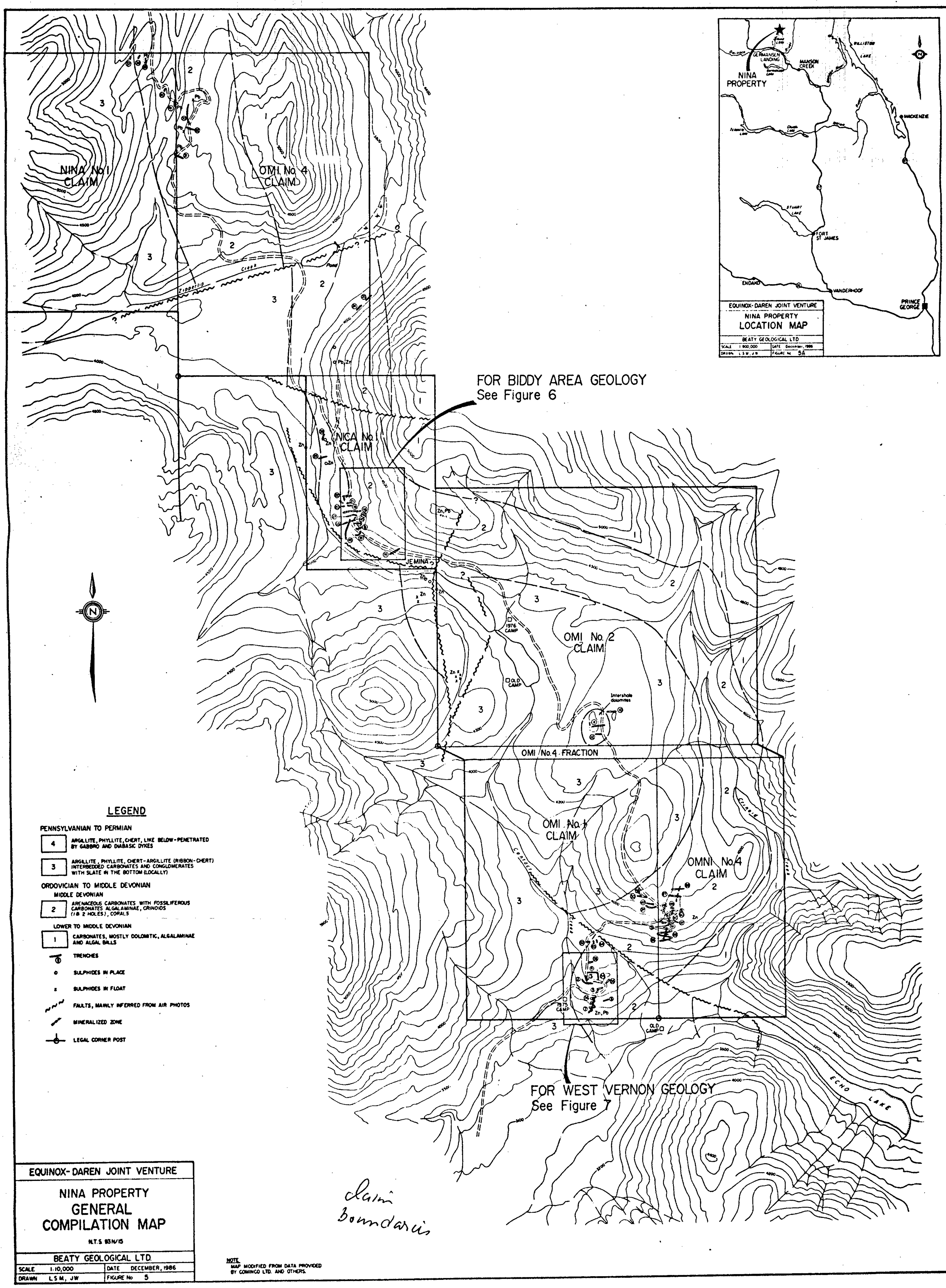
### 7.2.1 Biddy Area

Trenching in this area (see Figure 6) has located a number of mineralized showings - all are structurally controlled in a narrow zone. Sphalerite occurs as orange grains and patches disseminated in:

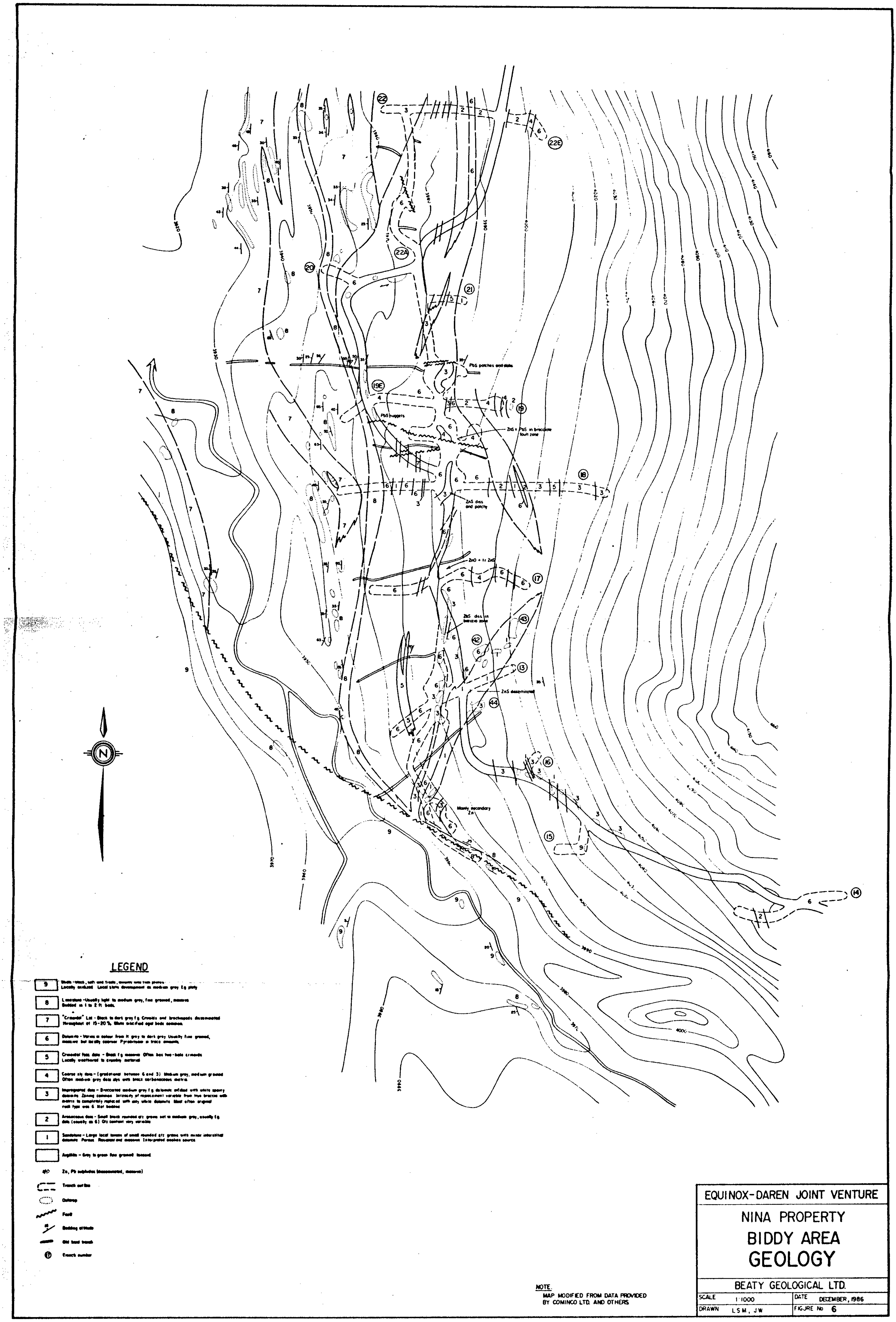
1) original porous zones such as sandstones and arenaceous dolomite in Trench 13 area (1.5% Zn across 10 m, representing about 2.5 m of true section).

2) tectonically prepared porous - permeable zones such as the "impregnated dolomite" breccia in the "pit" area (1.2% Zn over 10m).

Remobilization along faults and fractures has further concentrated the sphalerite in selected areas such as where an east-west fault cuts across the Centre Pit (1.95% Zn, 1.25% Pb across 1 m) and at the north (road) end of Trench 45 (3.5% Zn over 1 m). These assays are across fault breccias that closely resemble the "crush breccia" of the East Vernon area. The surface showing at the north end of Trench 45 is approximately 12 m long by 3 m wide. This showing is likely related to a similar showing 40 m south in the same stratigraphic horizon (junction of Trenches 13 and 45). Elsewhere in the Biddy area, minor mineralization occurs as trace specks and secondary oxides in suitably prepared zones (shrinkage breccia, joints, etc.).



NINA PROPERTY
LOCATION MAP
EQUINOX-DAREN JOINT VENTURE
BEATY GEOLOGICAL LTD
GERMANSEN LANDING
MANSON CREEK
MACKENZIE
FORT ST JAMES
ENDAKO
VANDERHOOF
PRINCE GEORGE
NINA No.1 CLAIM
OMI No.4 CLAIM
NICA No. CLAIM
FOR BIDDY AREA GEOLOGY
See Figure 6
JEMINA
OMI No.2 CLAIM
OMI No.4 FRACTION
OMI No.1 CLAIM
OMNI No.4 CLAIM
1976 CAMP
OLD CAMP
1975 CAMP
FOR WEST VERNON GEOLOGY
See Figure 7
ECHO LAKE
LEGEND
PENNSYLVANIAN TO PERMIAN
4 ARGILLITE, PHYLLITE, CHERT, LIKE BELOW-PENETRATED BY GABBRO AND DIABASIC DYKES
3 ARGILLITE, PHYLLITE, CHERT-ARGILLITE (RIBBON-CHERT) INTERBEDDED CARBONATES AND CONGLOMERATES WITH SLATE IN THE BOTTOM (LOCALLY)
ORDOVICIAN TO MIDDLE DEVONIAN
MIDDLE DEVONIAN
2 ARENACEOUS CARBONATES WITH FOSSILIFEROUS CARBONATES ALGALAMINAE, CRINOIDS (1 & 2 HOLES), CORALS
LOWER TO MIDDLE DEVONIAN
1 CARBONATES, MOSTLY DOLOMITIC, ALGALAMINAE AND ALGAL BALLS
TRENCHES
SULPHIDES IN PLACE
SULPHIDES IN FLOAT
FAULTS, MAINLY INFERRED FROM AIR PHOTOS
MINERALIZED ZONE
LEGAL CORNER POST
EQUINOX-DAREN JOINT VENTURE
NINA PROPERTY
GENERAL
COMPILATION MAP
N.T.S. 93N/15
BEATY GEOLOGICAL LTD.
SCALE 1:10,000
DATE DECEMBER, 1986
DRAWN L.S.M., J.W.
FIGURE No 5
NOTE
MAP MODIFIED FROM DATA PROVIDED BY COMINCO LTD. AND OTHERS.
claim boundaries



LEGEND
Limestone - Usually light to medium grey, fine grained, massive Bedded in 1 to 2 ft beds
Dolomite - Varies in colour from lt grey to dark grey Usually fine grained, massive but locally coarser
Crinoidal fine dolo - Black f.g. massive Often has two-hole crinoids Locally weathered to crumbly material
Coarse xly dolo - (gradational between 6 and 3) Medium grey, medium grained Often medium grey dolo xlys with black carbonaceous matrix
Arenaceous dolo - Small black rounded qtz grains set in medium grey, usually f.g. dolo (usually as 6) Qtz content very variable
Argillite - Grey to green fine grained laminated
Zn, Pb sulphides (disseminated, massive)
Trench outline
Outcrop
Fault
Bedding attitude
Old hand trench
Trench number
PbS patches and slabs
PbS nuggets
ZnS + PbS in breccia fault zone
ZnS diss. and patchy
ZnO + tr ZnS
ZnS diss. in breccia zone
ZnS disseminated
Mainly secondary Zn
NOTE:
MAP MODIFIED FROM DATA PROVIDED BY COMINCO LTD. AND OTHERS.
EQUINOX-DAREN JOINT VENTURE
NINA PROPERTY
BIDDY AREA
GEOLOGY
BEATY GEOLOGICAL LTD.
SCALE 1:1000
DATE DECEMBER, 1986
DRAWN LSM, JW
FIGURE No 6

The best showing on the Nina Property is the Jemima occurence (Murrall and Pedley, 1976). Here dark orange sphalerite with rounded fragments of dark dolomite is found in several hand trenches across 60 m. The controlling fault trends toward the Biddy area and the two are likely continuous. The Biddy-Jemima connection is a prime target for developing ore reserves by drilling.

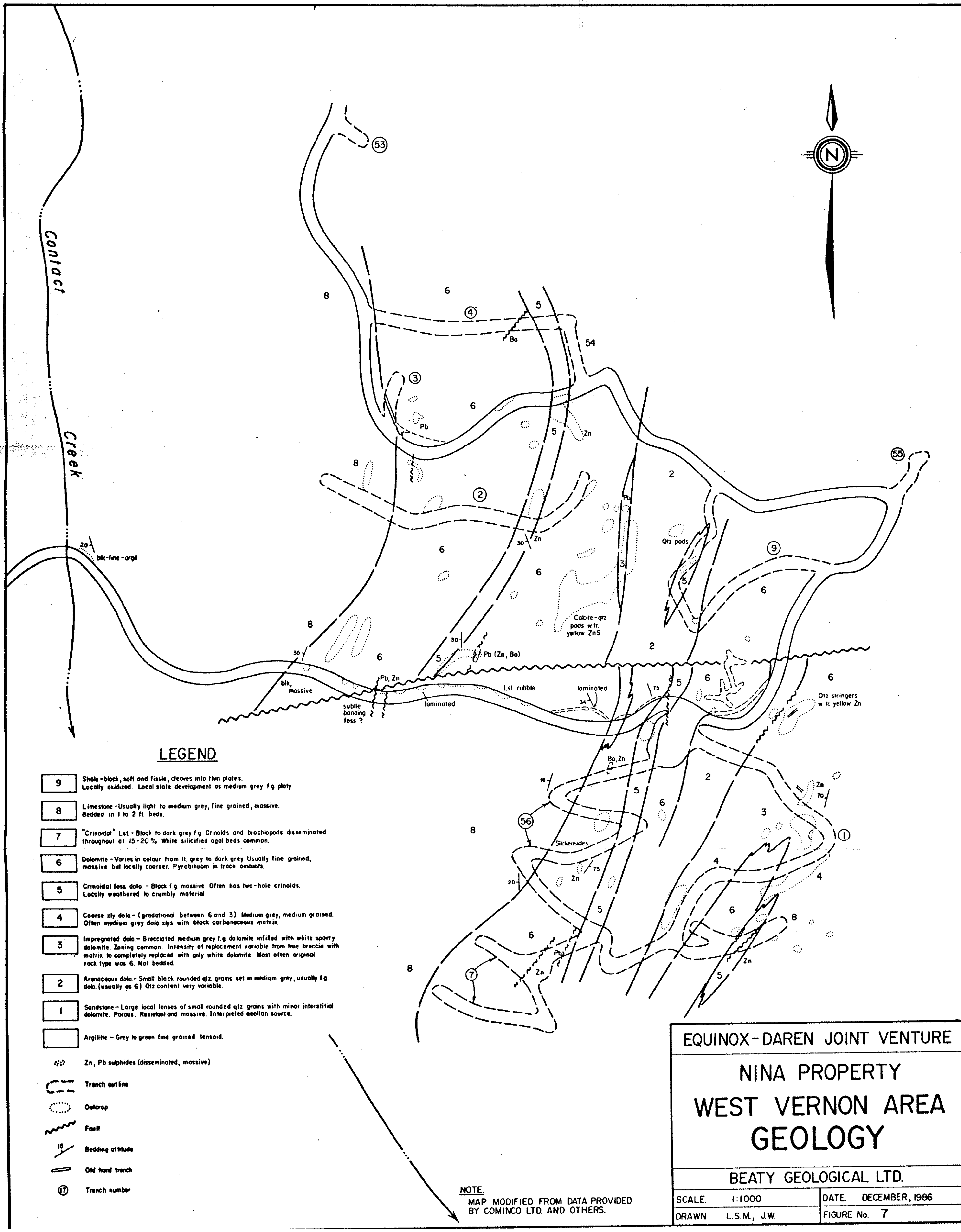
7.2.2 West Vernon Area

Sulphide mineralization in the West Vernon area (see Figure 7) was tested by numerous trenches, attempting to identify extensions of known showings. An excellent showing "A" is a large pod of leached and brecciated sphalerite in arenaceous dolomite. It outcrops as a large white zone which is 40 m long by 15 m wide. Mineralization is consistently between 5 and 7% Zn with silver to 2 oz./T. A pipe-like configuration is inferred within a major east-west strike slip fault. Drill testing of this target is recommended.

The showing in Trench 7 is approximately 10 m wide and contains patchy sphalerite with some galena. Values to 6% combined lead-zinc along 4 m are present in a shattered black dolomite. The fault dies off to the north.

The showing in Trench 3 resembles the galena showings in both Trench 19 and Trench 46 (East Vernon). Galena and barite are present with greenish "argillite". Nuggets of oxidized galena are scattered through a leached, rusty "grunge" zone beneath the argillaceous layer. Lead values are fairly consistent on the south part of the trench. The wall averages 8% Pb (no Zn) over an area of 12 m x 2 m and this consistency is probably due to reprecipitation after leaching. The detailed geology is complex. No extension was discovered by trenching.

A scattering of other showings are minor occurences of disseminated orange or yellow sphalerite grains, or small shears of barite associated with galena. Most appear to be late stage features.


Contact
Creek
LEGEND
9 Shale - black, soft and fissile, cleaves into thin plates. Locally oxidized. Local slate development as medium grey f.g platy
8 Limestone - Usually light to medium grey, fine grained, massive. Bedded in 1 to 2 ft. beds.
7 "Crinoidal" Lst - Black to dark grey f.g. Crinoids and brachiopods disseminated throughout at 15-20 %. White silicified agal beds common.
6 Dolomite - Varies in colour from lt. grey to dark grey. Usually fine grained, massive but locally coarser. Pyrobituam in trace amounts.
5 Crinoidal foss. dolo. - Black f.g. massive. Often has two-hole crinoids. Locally weathered to crumbly material
4 Coarse xly dolo. - (gradational between 6 and 3). Medium grey, medium grained. Often medium grey dolo. xlys with black carbonaceous matrix.
3 Impregnated dolo. - Brecciated medium grey f.g. dolomite infilled with white sparry dolomite. Zoning common. Intensity of replacement variable from true breccia with matrix to completely replaced with only white dolomite. Most often original rock type was 6. Not bedded.
2 Arenaceous dolo. - Small black rounded qtz. grains set in medium grey, usually f.g. dolo. (usually as 6) Qtz content very variable.
1 Sandstone - Large local lenses of small rounded qtz grains with minor interstitial dolomite. Porous. Resistant and massive. Interpreted aeolian source.
Argillite - Grey to green fine grained lensoid.
Zn, Pb sulphides (disseminated, massive)
Trench outline
Outcrop
Fault
Bedding attitude
Old hand trench
Trench number
blk-fine-argil
blk, massive
subtle banding foss ?
laminated
Lst rubble
Pb, Zn
Pb (Zn, Ba)
Qtz pods
Calcite - qtz pods w. tr. yellow ZnS
Qtz stringers w. tr. yellow Zn
Slickensides
NOTE
MAP MODIFIED FROM DATA PROVIDED BY COMINCO LTD. AND OTHERS.
EQUINOX-DAREN JOINT VENTURE
NINA PROPERTY
WEST VERNON AREA
GEOLOGY
BEATY GEOLOGICAL LTD.
SCALE 1:1000
DATE DECEMBER, 1986
DRAWN L.S.M., J.W.
FIGURE No. 7

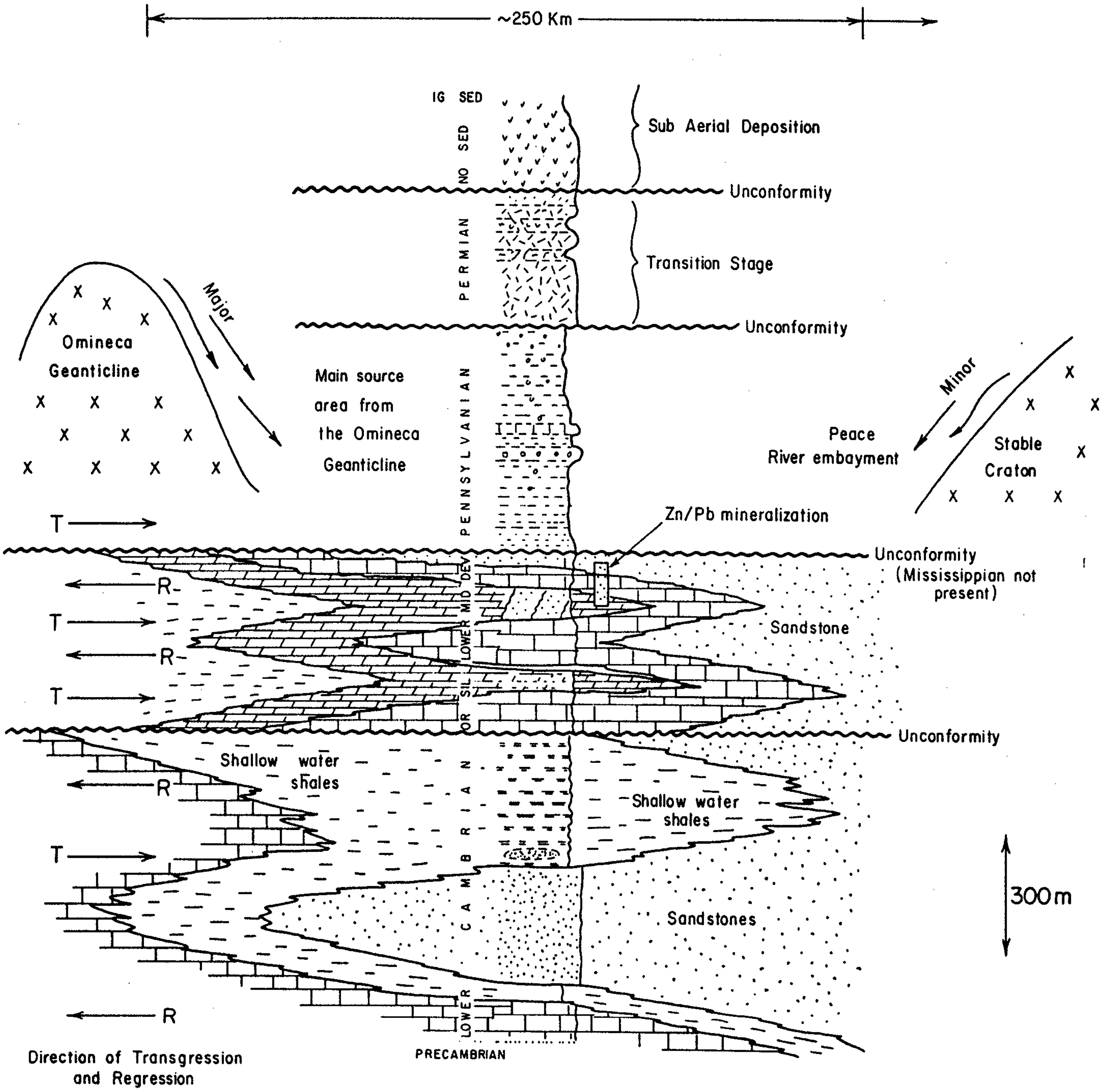
## 7.3 Interpretation

Speculation as to the origin of mineralization at Nina Lake is based on the opinions and conclusions of various geologists who have worked in this region. A facies interpretation of this geological environment is shown schematically in Figure 4.

The stratigraphic column shows a series of transgressions and regressions of Proterozoic sea. Prior to a major unconformity during Mississippian time the land mass extended to the east near the B.C.-Alberta border. The sandstones and clastics in the stratigraphic column represent material derived from this land mass. The shales and carbonates are of shallow water derivation which is shown by the abundance of algae and algal mats. No evidence of reef development is present in this area although local colonial and solitary corals are present. A major unconformity at the end of the Lower Cambrian section was followed by an overall major transgression during Ordovician to Middle Devonian times. This major transgression contained several smaller transgressions and regressions. During the last major withdrawal of the sea to the west, the sandstones and shallow water sediments were deposited that now host the Nina Property mineralized zones.

The Pennsylvanian Period saw the development of the Omineca Geanticline to the west of the Nina area. Much of the material comprising the Pennsylvanian is derived from this geanticline. The Permian represents a transition from sedimentary to sub-aerial deposition and the Permian volcanics are sub-aerial.

Of particular interest to mineralization on the Nina claim group is the Middle Devonian just below the unconformable contact with the Pennsylvanian argillites and slates. All the lead-zinc showings in the Nina area are found 50-75 m stratigraphically below this contact. This interval consists mainly of medium grey fine-grained dolomite but has local interbeds of arenaceous dolomite grading to sandstone, all grading into massive and crinoidal limestone near the upper unconformable contact. Except for the upper limestone, these units are present very irregularly through the section, and often they cannot be correlated from trench to trench over a 75 meter interval (Biddy area). They interfinger and overlap as might be expected in a relatively




# GEOLOGIC SECTION IN NINA VICINITY

Diagram showing interpretation of onlap and offlap of ocean to give rock types present in NINA Vicinity.

| | |
|---|---|
| EQUINOX-DAREN JOINT VENTURE | |
| NINA PROPERTY<br>**STRATIGRAPHIC INTERPRETATION** | |
| BEATY GEOLOGICAL LTD. | |
| SCALE 1:20,000 | DATE December, 1986 |
| DRAWN L.S.M., J.W. | FIGURE No. 4 |

shallow water environment. The sand grains have been interpreted to be of eolian source, having been blown out to sea and settled into the carbonate environment. No reef buildup is evident.

Complicating this picture is a late-stage development of white to cream dolomite breccia (called "impregnated dolomite" on the trench map). These are large, cross-cutting pods of grey dolomite breccia fragments cemented or replaced by white dolomite. Locally the replacement is almost complete to give an overall white to cream breccia looking rock type that contains no visible grey breccia fragments. Disseminated sphalerite is sometimes found within these zones. Small, local pods of breccia are common and are interpreted as being shrinkage breccias, formed by the volume reduction of limestone during dolomitization.

## 7.4 Trace Element Considerations

The primary objective of the fall 1986 field program at Nina Lake was an evaluation of trace element values (especially germanium) in known zinc sulphide mineralization. High zinc and germanium values were indicated from earlier sampling and it was essential to know if the elevated levels were a general character of sphalerite from the property and the range of germanium levels that could be expected in any zinc concentrate obtained from this area. Table I below is a listing of pertinent data from representative samples.

TABLE I

Nina Lake Area - Trace Element Data

| Sample | Area | Zinc % | Ge(ppm) | Ga(ppm) | Est. Ge(ppm) 60% Zn Con. | Ge con. Value3 |
|---|---|---|---|---|---|---|
| 11 | Biddy | 1.01 | 30 | -- | 1782 | $1889 |
| 14 | Biddy | .01 | 80 | -- | -- | -- |
| 19 | Biddy | 4.57 | 40 | -- | 525 | 556 |
| 16 | Vernon [1] | -- | 120 | 260 | -- | -- |
| 17 | Vernon | 4.67 | 70 | -- | 905 | 959 |
| 02 | Donna[2] | 4.11 | 50 | -- | 730 | 739 |
| | | | | average | 872 | $ 924 |

1. Pyrite rich sample with no zinc but notable because of very high gallium content.

2. From off property but from same mineralized belt.

3. Gross zinc concentrate germanium value assuming currently listed price of $1060 (U.S.) per kilogram Ge metal

Value calculations in Table I assume that germanium is contained in a typical zinc (60% metal) concentrate and would be obtained as a smelter by-product. Levels greater than 200 ppm are of interest to smelters. The high gallium value (sample 16) comes from a pyritic rock with no significant zinc content.

Two main conclusions are apparent from the trace element work carried out at Nina Lake. These are:

1. Zinc mineralization from the Nina property consistently carries high and possibly economic levels of germanium. It would be safe to assume a 500 ppm average for the germanium content of Nina sphalerite.

2. Potential exists for gallium associated with iron sulphide. This possibility should be tested in the future.

## 8. GEOCHEMISTRY

Future prospecting work in the Nina property vicinity should rely heavily on geochemistry which has proven effective. The relative absence of outcrop or associated float in the mineralized belt makes this the most viable indirect prospecting method. While false anomalies can occur this survey technique has successfully delineated zones later exposed by trenching. Previous geochemical work in this region has defined background, threshold and anomalous values (Murrell and Pedley, 1976).

## 9. GEOPHYSICS

In the fall of 1986 an orientation VLF-EM survey was carried out across strong mineral showings at Nina Lake. The object was to evaluate EM as an exploration tool. The survey was not successful. Sphalerite, the primary mineral of interest, is a poor conductor and graphite is common in the area - a source of false anomalies. It is not, therefore, recommended that any additional electromagnetic work be carried out.

## 10. TRENCHING

Cominco Ltd. carried out a bulldozing program in 1976 with the following objectives:

1. To better expose known showings to improve understanding of the geological control in addition to determining the extent and grade of mineralization.

2. To test for the supposed continuity of mineralization between showings that were exposed in old hand trenches.

3. To test for possible extensions of mineralization beneath covered zones.

4. To test geochemical anomalies and geological targets by revealing the bedrock.

Trenches were mapped at a scale of 1 inch = 40 feet and sampled when Pb/Zn mineralization was present. The separate trench data were then summarized and correlated, where possible, on 1 inch = 100 feet maps. Most trenches were back filled while some which coincided with roads were "left open".

The trenching program was successful as far as it went. Although most trenches were backfilled to satisfy reclamation requirements, several critical to geologic interpretation including numbers 3, 48, 14, and 22 (from south to north) are open. The Jemina showings, exposed by each hand trenching, in fact, were never covered by Cominco claims and consequently omitted from the 1973-74 bulldozing program.

## 11. ECONOMIC EVALUATION

The best zinc occurrence so far delineated on the Nina property ("A" showing) consists of a large pod 40 meters long and 15 meters wide, containing between 5 and 7% zinc and up to 2 oz. silver/T. Here a pipe like geometry is inferred. Numerous low grade zinc showings (+3%) occur. Stratabound mineralization on one showing returned assays averaging 5% zinc and 1.3 oz. silver/T across a six meter thickness and over a 45 meter strike length.

Given data available at this time, it is reasonable to assume a 500 ppm (range 480 - 1780 ppm) average content of germanium in sphalerite from this property. If the average grade were 4% zinc then a tonne of ore would contain about 35 ppm germanium. The price for germanium is usually quoted as $1060 (U.S.)/kg. In a tonne of concentrate running 60% zinc and 500 ppm germanium, the gross value of contained zinc, at current prices, would be (@0.45c/lb) $595 or about $600 while the germanium would be worth $503 or about $500.

Cominco's Trail smelter considers anything over 200 ppm in a zinc concentrate to be of distinct economic interest from a by-product point-of-view. The richest primary ore source currently being mined is Pennarroya's St. Salvy mine in France which has between 600-800 ppm germanium in the concentrate.

The gross value of "ore" from the Nina property assuming 4% zinc, 1% lead, 1.2 oz/T silver and 35 ppm germanium would be approximately $85 (US)/T at today's metal prices. This is well within potentially economic parameters for an open pit mining operation. On this basis further exploration appears warranted to verify grade and establish tonnage reserves on the Nina property.

## 12. RECOMMENDED PROGRAM

The following is a summary of a recommended exploration program to further test the property's potential. The program is staged to permit a review of data prior to a major commitment of funds.

### STAGE I

| | |
|---|---|
| Diamond drilling (BQ wireline)<br>8 x 100 m holes for 800 m<br>800 m @ $100/m (all-up cost) | 80,000 |
| Drill collar survey and base map | 3,500 |
| Engineering and supervision | 10,000 |
| Contingencies | 10,000 |
| Total Stage I | $100,000 |

STAGE II

| | |
|---|---|
| Assume program of trenching and diamond drilling contingent upon result of Stage I work | $250,000 |
| Total Stage I and II | $350,000 |

7 January 1988

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## 14. CERTIFICATES

I, Douglas G. Leighton, do hereby certify that:

1. I am a professional geologist with offices at 500 - 576 Seymour Street, Vancouver, B.C.

2. I am a graduate of the University of British Columbia, B.Sc., (1968).

3. I am a fellow in the Geological Association of Canada.

4. I have practiced by profession as a geologist since 1968 mostly in British Columbia.

5. I personally supervised work on the Nina Property for Equinox Resources Ltd. and Daren ResourcesLtd.

6. I have not received, nor do I expect to receive, any interest direct or indirect, in the Nina Property, in the Equinox-Daren joint venture, or in the securities of either Equinox Resources Ltd. or Daren Resources Ltd.

Dated at Vancouver, British Columbia, this 15th day of September, 1987.

Douglas G. Leighton, B.Sc., F.G.A.C.

GEOLOGICAL ASSOCIATION OF CANADA
D. G. LEIGHTON
FELLOW

# APPENDIX I

## THIN SECTION DESCRIPTIONS

### SUMMARY

Sample 1701 Galena from #16 trench Biddy Area

Sample 1701 is a mineralized breccia. It consists of ovoid fragments of a sediment (tuff) consisting of fine quartz clasts in a feldspathic cement, coarse patchwork of galena, with calcite and barite.

Sample 1702 Sphalerite from #5 trench Vernon Area

Sample 1702 is a calcite-sphalerite rock in which almost all the original minerals have been replaced. It is apparently a breccia with angular dark grey fragments which are scattered in a brownish matrix; thin veinlets of calcite cut through the matrix and fragments. The dark fragments are fine calcite intergrown with pyrite and fine sphalerite; the brownish matrix is an intergrowth of coarser calcite and sphalerite without much pyrite.

1701: MINERALIZED BRECCIA.

This sample consists of ovoid fragments of sediment, one or two centimeters in size, which are cemented by a coarse patchwork of galena (dominant) intergrown with barite and calcite. The sediment (tuff ?) is finely layered due to variations in the proportions of clastic material (quartz grains) and cementing material (mainly K-spar). Patches of galena and associated minerals have developed within some of the fragments. Excluding the breccia cement which makes up about 70% of the hand specimen, minerals are:

| | | |
|---|---|---|
| K-spar | 45% | (with incipient clay/chlorite) |
| quartz clasts | 30 | |
| galena | 9 | |
| calcite | 7 | |
| barite | 5 | |
| pyrite | 3 | |
| quartz vein | 1 | |
| sericite | minor | |

Quartz clasts are rounded to subangular and about 0.1mm in size. These are embedded in a matrix consisting of extremely fine K-spar which is intimately mixed with incipient, cryptocrystalline clay or chlorite-like material. Indistinct layering on a scale of less than 1mm occurs is due to slight variations in the proportions of clasts to cement; the "layers" are often lensey and pinch out. Rounded pyrite grains 0.01 to 0.05mm in size, with a few up to 0.2mm, are disseminated throughout the matrix. A few flakes of sericite about 0.05mm in size are scattered within it and are part of the alteration assemblage.

Galena occurs in rounded patches up to 5mm in size and in vein-like patches about 1mm in width and a few millimeters in length; they are not necessarily connected to the breccia matrix. The large patches of galena are almost completely surrounded by a zone of calcite about 0.2 to 0.8mm wide. A small amount of quartz is intergrown with the calcite at the edges of the zone and small barite grains occur close to and partly within the galena. In the vein-like patches the galena is scattered along the vein and is intergrown with tabular barite grains up to 1.5mm in length and with subrounded calcite grains 0.2 to 1.0mm in size (dominant). At the edge of these elongated patches there is a thin zone of small quartz grains intergrown with sericite and with the calcite-barite-galena in the core. Small grains of calcite are scattered throughout the rock. Barite also occurs scattered within the rock, forming splays of bladed grains up to 2.5mm in length. There is sometimes a narrow zone of quartz and sericite around these.

1702: CALCITE-SPHALERITE ROCK (ALTERED BRECCIA).

This rock consists of dark grey subangular to shapeless fragments of an unknown rock type scattered in a brownish coloured matrix. Fragments are mainly 2 to 8mm in size and are completely altered. A widely spaced system of thin calcite veins cuts through the rock. The matrix consists of an intergrowth of sphalerite and calcite. The fragments are also calcite but it is much finer and is intergrown with pyrite and very fine sphalerite. Minerals are:

| | |
|---|---|
| calcite | 85% |
| sphalerite | 13 |
| pyrite | 2 |
| quartz | minor |
| sericite | trace |
| graphite (?) | trace |

The dark patches or fragments consist of an intimate intergrowth of rounded calcite grains and shapeless sphalerite grains less than 0.1mm in size, occuring in roughly equal amounts. Rounded pyrite grains less than 0.05mm in size are scattered amongst these. In places there are patches of fine calcite and scattered pyrite which may also have been fragments but do not contain the sphalerite. Small dirty patches which do not polish well and which are scattered within and amongst the calcite/sphalerite are supected to contain incipient graphite but this was not recognised with certainty.

The bulk of the rock, enclosing the fragments, consists of subrhombic to subrounded interlocking calcite grains 0.2 to 1.0mm in size. Intergrown with these are subrounded, amoeboid sphalerite grains 0.1 to 1.0mm in size, in places forming an interconnected patchwork. Clusters and small aggregates of sphalerite are quite common. In the larger aggregates (up to 2.5mm) the sphalerite contains thin sericite flakes about 0.1mm in length. Rounded pyrite grains 0.05 to 0.2mm in size are scattered amongst the calcite and sphalerite, sometimes being included in the sphalerite.

Quartz forms subrounded grains 0.1 to 0.3mm in size which are scattered between and within the calcite grains and appear to be partly replaced larger grains.

# APPENDIX II

## GERMANIUM SUPPLY - DEMAND SITUATION

Modifed after L.R. Bernstein (1986)

(All dollar values U.S.)

Following a strong market in the mid-1970's through the early 1980's, when the price of Ge went from $293/kg in 1976 to $1060/kg in 1982, the market has softened in the last two years. Though the published price has remained constant at $1060/kg, there has been discounting (due partly to the high value of the dollar). Germanium dioxide is sold at $660/kg (also discounted).

In recent years, germanium has been recovered almost exclusively as a by-product of sphalerite processing. Ore is produced primarily from Elmwood and Gordonsville Mines in Tennessee, and the Saint-Salvy deposit in southern France. Other zinc mines around the world, including Pine Point, Canada, produce varying amounts of germanium-bearing concentrates. Concentrates from the Tennessee ores are shipped to Metallurgie Hoboken-Overpelt SA (MHO) in Belgium, the leading refiner of Ge (>20,000 kg/yr). Societe Miniere et Metallurgique de Pennarroya in France refines most of the Saint-Salvy ore. Eagle-Picher Industries Inc., Quapaw, OK produces Ge from a variety of domestic and imported concentrates (about 20,000 kg/yr), while Societa Mineraria e Metallurgica di Pertusola S.A. in Italy, Preussag Metall AG in West Germany (about 10,000 kg/yr), and Bleiberger Bergwerks Union AG in Austria are other major producers. China, Japan, and the U.S.S.R. also produce considerable amounts of Ge. Japan is rapidly increasing its Ge production capacity, and is apparently using some Kuroko-type ores as feedstock. Current world production and demand is about 100,000 kg/yr of Ge. Estimates of production in 1983 are given in Table B-1.

TABLE B-1 GERMANIUM PRODUCTION IN 1983

| Country | Ge Production (kg) |
|---|---|
| U.S. | 20,000 |
| Belgium | 20,000 |
| France & Italy | 20,000 |
| Germany (FRG) | 10,000 |
| China | 5,000 |
| USSR & East Europe | 10,000 |
| Total | 85,000 |

Estimates are those of the U.S. Bureau of Mines, 1985. Figures include refinery production from both domestic and imported feedstocks. Most ore was produced in the U.S. and France.

## TABLE B-2 GERMANIUM SUPPLY-DEMAND SUMMARY

| Year | U.S. Production (1000 kg) | U.S.Refinery Capacity (1000 kg) | World Production (1000 kg) | World Refinery Capacity (1000 kg) | U.S. Demand (1000 kg) | World Demand (1000 kg) |
|---|---|---|---|---|---|---|
| 1980 | 27 | -- | 116 | -- | 32 | 116 |
| 1983 | 20 | 40 | 85 | 245 | 35 | 85 |
| 1990 | -- | 60 | -- | 245 | 55 | 140 |
| | | | | | low high prob. | low high prob. |
| 2000 | -- | -- | -- | -- | 45 180 85 | 110 450 265 |

Estimates are those of the U.S. Bureau of Mines, 1985; forecasted demands are considered very conservative.

## TABLE B-3 ESTIMATED GERMANIUM DEMAND BY USE

## 1986 - 1996 (METRIC TONS)

| | 1986 | 1991 | LOW | PROBABLE | HIGH |
|---|---|---|---|---|---|
| Infrared Optics | 55 | 50 | 35 | 45 | 70 |
| Catalysts | 45 | 80 | 85 | 100 | 200 |
| Fiber Optics | 25 | 30 | 35 | 45 | 100 |
| Electronics | 5 | 7 | 5 | 10 | 40 |
| Medicine | 5 | 17 | 5 | 40 | 150 |
| Optical Storage | 0 | 30 | 30 | 100 | 200 |
| Other | 5 | 6 | 5 | 10 | 70 |
| TOTAL | 140 | 220 | 200 | 355 | 830 |

Due to the recent softening of the market, and the expected production of the Apex Mine (about 14-18,000 kg/yr), interest in finding new germanium resources has generally declined. There are several recent and potential developments that could quickly change the supply-demand situation, however: (1) low zinc prices have made the Tennessee mines unprofitable, and they may be closed; (2) the Pine Point Mine is scheduled to close in 1987; (3) the U.S. military has become concerned about Ge supplies, and had Ge made a strategic material in 1984; 30,000 kg were originally requested for the stockpile,a nd this was raised to 147,000 kg in 1985 (none has yet been purchased); and (4) new high-volume uses for Ge are being developed, as discussed below. The Ge market is much more diverse than that for Ga, and includes more high-volume uses than does the Ga market (microelectronics). In addition, many potential uses are awaiting lower Ge prices.

Uses, technological develoments and other demand considerations: The major uses for Ge can be classed as: (1) electronic components; (2) infrared optics; (3) fiber optics; (4) catalysts; (5) medicines; and (6) alloys. In the future, optical storage devices could become the major, high volume use of germanium. These uses are considered separately below, together with some emerging markets, particularly optical storage. In 1984, the estimated world-wide uses in percents were:

| Use | Percent |
|---|---|
| Infrared Optics | 48 |
| Catalysts | 20 |
| Fiber Optics | 18 |
| Electronics | 5 |
| Medicines | 4 |
| Other | 5 |

Electronics: After being the predominant semiconductor in the 1950's and 1960's, Ge now represents less than 2% of this market. The current usage represents applications where Ge is considered far superior to other materials, such as some ultra-high frequency devices and solid-state x-ray, gamma-ray, and infrared detectors. It is also a preferred substrate for LED's. Many of the highest efficiency photovoltaic materials also use considerable amounts of Ge, as well as Ga and Si. All of these markets, except LED's, are expected to gradually increase through the rest of the century.

Infrared optics: This is currently the major use of Ge, accounting for about half the Ge market. Germanium metal, as well as some Ge alloys and glasses, is transparent to infrared radiation having wavelengths longer than 2 micrometers. It can thus be used in the same way that optical glass is used for visible light: to make lenses and windows to transmit and focus infrared radiation onto film or electronic detectors. The major applications are: (1) military: for night-viewing scopes on airplanes, tanks, guns, etc.; also for guidance systems on missiles, airplanes, and various vehicles; (2) night-viewing equipment (also for fog and smoke) for police, firemen, researchers, and others; (3) satellite mapping equipment; (4) medical diagnostic equipment (increasingly used for detecting tumors in the early stages); (5) heat-loss monitoring for buildigns and industrial equipment; and (6) monitoring devices for fire alarms. These uses have all been increasing, and will remain strong through at least the rest of the decade. Since most of the military equipment is stockpiled or is destroyed, little Ge will become available for recyling.

Fiber optics: This industry is experiencing considerable growth, and much more is expected through the end of the century. In most modern fibers, up to several percent Ge is added to the cores to increase transmissivity. The major volume use for fiber optics is as cables to replace conventional wire telecommunications systems. Major advantages of fiber optics over wire are: (1) compact size (as little as one-fifth the space of Cu cables), so that systems can enlarge their capacities without having to create new, expensive underground conduits; (2) no chance of short circuits; (3) no problems with distortions caused by changes in the electromagnetic field; and (4) they cannot be tapped by any known technology. Many companies around the world are getting into this field; in 1986, Corning Glass Works and Siecor Optical Cable Plant are expected to open plants that will each produce over one million km of fiber per year, and amany other plants are also opening. All the major telecommunications companies, including AT&T, GTE and MCI, are now installing fiber optics cables. For fiber optics applications, $GeCl_4$ and $GeO_2$ are used rather than Ge metal, at lower costs.

Catalysts: Germanium compounds (mainly $GeO_2$) have long been known as excellent catalysts for petroleum cracking and some plastics manufacturing, though the high price and uncertain supply of Ge have discouraged many users. The Japanese, however, are moving ahead rapidly in this field. They now use Ge as a major catalyst in the production of polyester fiber and polyethylene terephalate (PET), a common commercial material for plastic bottles. If other countries follow this lead, Eagle-Picher estimates that this will become the major use for Ge in the next two years. Even a small increase in Ge supplies and decrease in prices could increase this market by several fold.

Medicines: Germanium and many of its compounds have very low toxicities for humans and higher animals, but are toxic to most plants and micro-organisms. In the past few years, several organic germanium compounds have proven to be pharmacologically active against a variety of serious diseases, including cancer, malaria, and arthritis. Clinical, animal, and in-vitro trials are now being conducted in the United States, Japan, Europe, and elsewhere to establish levels of effectiveness and proper dosages.

The first compound tested (and still the most studied) is called spirogermanium. In vitro and animal studies showed taht this compound is very effective against many forms of cancer. Early results of human clinical trials (sponsored in part by NIH and the National Cancer Institute) are mixed, with some positive and some negative results. Spirogermanium appears to accentuate the effects of other anti-cancer drugs, so that lower (and less toxic) doeses are required. Spirogermanium itself has low toxicity, with transient neurotoxicity at very high doses.

Recent research shows that spirogermanium has several other important medicinal properties. Researchers at several universities in the United States, France, and elsewhere found that it is very effective in killing malaria parasites in vitro, including strains that are highly resistant to other drugs. Early results of human clinical and field trials are also encouraging for the injected form of the drug, and work has begun on oral administration. Spirogermanium is also effective against other parasitic diseases, based on early experimental results.

In addition, spirogermanium has beneficial effects on the immune system and against autoimmune diseases such as arthritis and possibly muscular dystrophy. The Smith, Kline and Beckman Company reports that spirogermanium may be the most effective drug tested against arthritis, acting on the causes of the disease and not simply on the resultant inflammation.

Other germanium drugs are being develop3ed primarily by the Japanese. The compound called Ge-132 was found to stimulate the production of interferon in mice, and generally appears to be effective against cancer and viruses, and in stimulating the immune system. It also appears to relieve paina nd to slow the progress of osteoporosis. Further trials of this compound are just beginning. Several other compounds are also under investigation as potential anti-cancer agents, the most promising being called PCAGeS. This compound is effective against several forms of cancer in mice, and also stimulates the immune system.

Several germanium compounds, particularly Ge-132, are currently sold in Japan in small quantities, mainly by the Koei International Co. in Osaka. This company has recently started selling Ge-132 (obtained from a cultivated herb) in the United States as a "food" product, as its use as a drug has not been approved by the FDA. The major outlet is currently Nutri-Cology, Inc. of San Leandro, CA. This market will probably remain very small, consisting mainly of health-food faddists.

The exclusive rights to spirogermanium are held by Unimed, Inc. of Somerviulle, NJ. Unimed is funding some of the current research, together with NIH, NCI, and the World Health Organization (WHO; mainly for malarial research), and some European and Japanese organizations. The spirogermanium is produced under contract by Norac of Azusa, CA. They have used as much as a few hundred kg per year of 99% $GeO_2$ in their operations. Spirogermanium is now very expensive ($20,000/kg), though the price will decrease as production increases.

Doses of spirogermanium are about 400 mg/day per patient, containing 72 mg Ge. About 250 million people now have malaria, and many millions more have other parasitic diseases, arthritis, and cancer. The potential for veterinary usage is also great. If 100 million doses are given in a year, about 7 tonnes of Ge (10 tonnes $GeO_2$) would be required; 1 billion doses would require 70 tonnes of Ge (100 tonnes $GeO_2$). If Ge-132 proves effective and safe in clinical trials and becomes an accepted drug, this could further increase the germanium demand: spirogermanium contains bout 18 wt. percent Ge, whereas Ge-132 contains about 43 wt. percent Ge.

Alloys: Small amounts of Ge are used as hardening agents for some Cu, Al and Mg alloys; this use has been limited by high Ge prices. Germanium is also used to make precision-casting gold alloys for dental and jewelry use. Specialty alloys, such as non-tarnishing yellow Cu-Ge alloys as gold substitutes in jewelry, have remained little used due to high Ge prices.

Optical storage: Through the present time, magnetic tapes and discs have been the predominate means of storing information for computers, as well as for many audio and video systems. Magnetic storage has several disadvantages, including: (1) deterioration with age and use; (2) susceptibility to erasure through exposure to changing electric and magnetic fields; and (3) relatively low information packing density. To overcome these difficulties, particularly the last one, it has become essential to develop new data storage devices. The most promising technology is optical storage, in which data is encoded and read by lasers on discs. These discs, several inches in diameter, can easily hold hundreds of megabytes of information (compared to a few megabytes for similar size magnetic discs). In addition, the discs can be constructed in protective transparent sheaths that protect them from deterioration with age and use, and they would be difficult to sabotage or accidentally destroy. At present, read-only compact laser discs are commercially available, made primarily of high density polymers.

Research to develop erasable an re-recordable discs is currently very intense. The most promising materials developed for such devices are germanium alloys, particularly germanium-tellurium alloys. The basic principles of these phase-change optical storage devices are: (1) the disc is coated with a layer of polycrystalline Ge alloy; (2) to encode data, very brief laser pulses hit the disc, and convert tiny spots of the drystalline alloy to a metallic glass; (3) the metallic glass has different optical properties than the crystalline alloy, and the data can be read by a low-intensity laser; and (4) the data can be erased and the disc made ready to accept new data by using longer laser pulses to anneal the metallic glass back to a crystalline alloy. As can be imagined, exceedingly few compounds have the necessary properties to meet the many constraints of this system. Since GaAs lasers are used, the light wavelengths are such that it is almost certain that Ge alloys must be used on the discs. According to people at IBM, this technology should become commercially available in 1987, and ultimately it will alrgely replace current magnetic storage materials. If, as now predicted, germanium is used in these devices, the demand for Ge will rapidly rise and will remain high for many years.

In 1985, roughly 2 billion magnetic tapes and discs were sold in the U.S., as well as about 400 million phonograph records. For the world, the figures are about four times as high, and are increasing by several percent per year. Assuming that re-recordable optical discs are about 5-1/4 inches in diameter and have Ge-alloy thicknesses of 0.1 to 1.0 micrometers, approximately 5 to 50 metric tons (mt) of Ge would be used for each billion discs. To cover the magnetic storage demand in 1985, roughly 10 to 100 mt of Ge would be required in the U.S., and 40 to 400 mt for the world. In 1991, when optical storage technology should be firmly established, the demand could be much greater. These figures are preliminary and very rough estimates, but they do indicate that demand for Ge could rise substantially in thenext few years due to the use of Ge alloys in optical storage discs.

At the moment, IBM and Xerox appear to be the leading U.S. companies developing optical storage materials, though many smaller companies are also involved and could produce breakthroughs. All of the Japanese electronics companies are also involved in intense research, and there are reliable reports that working prototype devices have been produced.

Other uses: Germanium compounds are also used as phosphors in many fluorescent bulbs. Many experimental superconductors also use Ge; if practical superconductors using Ge are developed, this would become a very high volume use.

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At the moment, IBM and Xerox appear to be the leading U.S. companies developing optical storage materials, though many smaller companies are also involved and could produce breakthroughs. All of the Japanese electronics companies are also involved in intense research, and there are reliable reports that working prototype devices have been produced.

Other uses: Germanium compounds are also used as phosphors in many fluorescent bulbs. Many experimental superconductors also use Ge; if practical superconductors using Ge are developed, this would become a very high volume use. Germanium is increasingly being used as an additive in optical glass, to increase the refractive index; this use is fairly price sensitive. In addition, some barium-germanium compounds are increasingly used in medical diagnostic techniques.

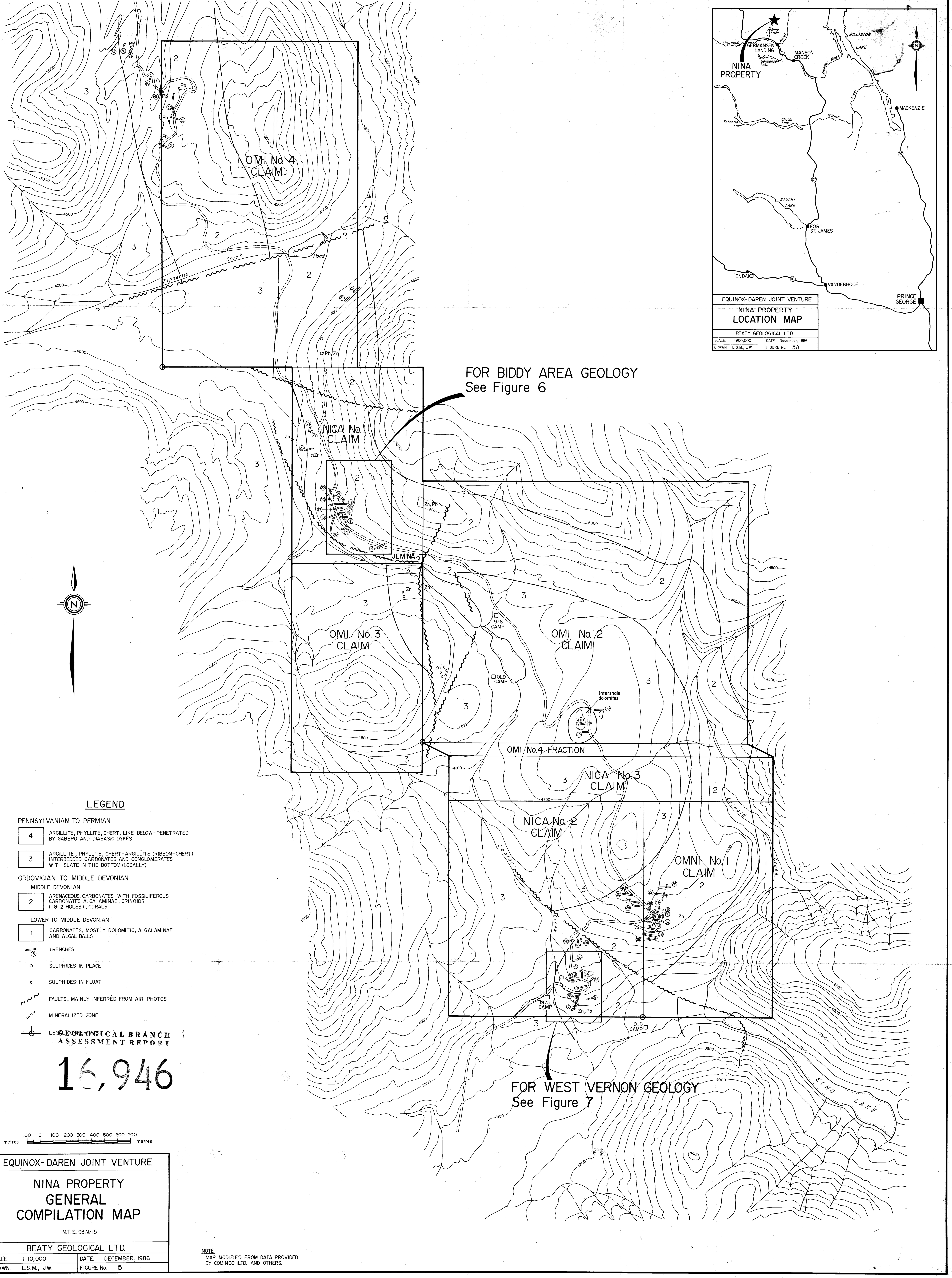
Outlook - Nearly all the uses mentioned above are expected to keep increasing through the rest of the century. Germanium demand for catalysts, fiber optics, medicines, and optical storage devices could increase substantially in the next few years. Importantly, any increase in supplies and decrease in prices could greatly expand all of these markets. If advances are made in Ge-based superconductors, this could provide a large market in the long term (10 to 20 years). The current lack of exploration activity for Ge, combined with uncertain by-product production from zinc deposits, provides an excellent opportunity to find large new deposits that would compete successfully against other suppliers.

# APPENDIX III

## STATEMENT OF COSTS

| | | |
|---|---|---|
| Wages: | | |
| *Geologists | $ 8,870.00 | |
| + 25% expenses | 2,217.50 | $ 11,087.50 |
| Assays | | 1,058.60 |
| Supplies | | 483.85 |
| Maps - Reports | $ 500.19 | |
| | 156.58 | 656.77 |
| Truck rental - 21 days @ $45 | | 945.00 |
| Telephone | | 31.39 |
| Photocopy | $ 3.20 | |
| | 54.98 | 58.18 |
| Secretarial | 80.00 | |
| | 450.00 | 530.00 |
| Accounting | | 320.00 |
| Drafting | | 906.00 |
| Expense Accounts | $ 4,231.64 | |
| | 193.52 | |
| | 85.70 | 4,510.86 |
| Courier | | 2.50 |
| | | $ 15,478.15 |
| 10% Administration | | 1,550.00 |
| | | $ 17,028.15 |

| | | | |
|---|---|---|---|
| * D.G. Leighton | Nov. 16-27 | 12 days | |
| | Dec. 2-5, 9-15 | 11 days | |
| | | 23 days @ $250 | $ 5,750 |
| G.A. Addie | Nov. 16-27 | 12 days @ $130 | 1,560 |
| J.L. Knox | Nov. 16-27 | 12 days @ $130 | 1,560 |
| | | | $ 8,870 |




EQUINOX-DAREN JOINT VENTURE
NINA PROPERTY
LOCATION MAP
BEATY GEOLOGICAL LTD.

| SCALE 1:900,000 | DATE December, 1986 |
|---|---|
| DRAWN L.S.M., J.W. | FIGURE No. 5A |

## LEGEND

PENNSYLVANIAN TO PERMIAN

4 — ARGILLITE, PHYLLITE, CHERT, LIKE BELOW-PENETRATED BY GABBRO AND DIABASIC DYKES

3 — ARGILLITE, PHYLLITE, CHERT-ARGILLITE (RIBBON-CHERT) INTERBEDDED CARBONATES AND CONGLOMERATES WITH SLATE IN THE BOTTOM (LOCALLY)

ORDOVICIAN TO MIDDLE DEVONIAN

MIDDLE DEVONIAN

2 — ARENACEOUS CARBONATES WITH FOSSILIFEROUS CARBONATES ALGALAMINAE, CRINOIDS (1 & 2 HOLES), CORALS

LOWER TO MIDDLE DEVONIAN

1 — CARBONATES, MOSTLY DOLOMITIC, ALGALAMINAE AND ALGAL BALLS

TRENCHES

SULPHIDES IN PLACE

SULPHIDES IN FLOAT

FAULTS, MAINLY INFERRED FROM AIR PHOTOS

MINERALIZED ZONE

LEGAL CORNER POST



100 0 100 200 300 400 500 600 700 metres

EQUINOX-DAREN JOINT VENTURE

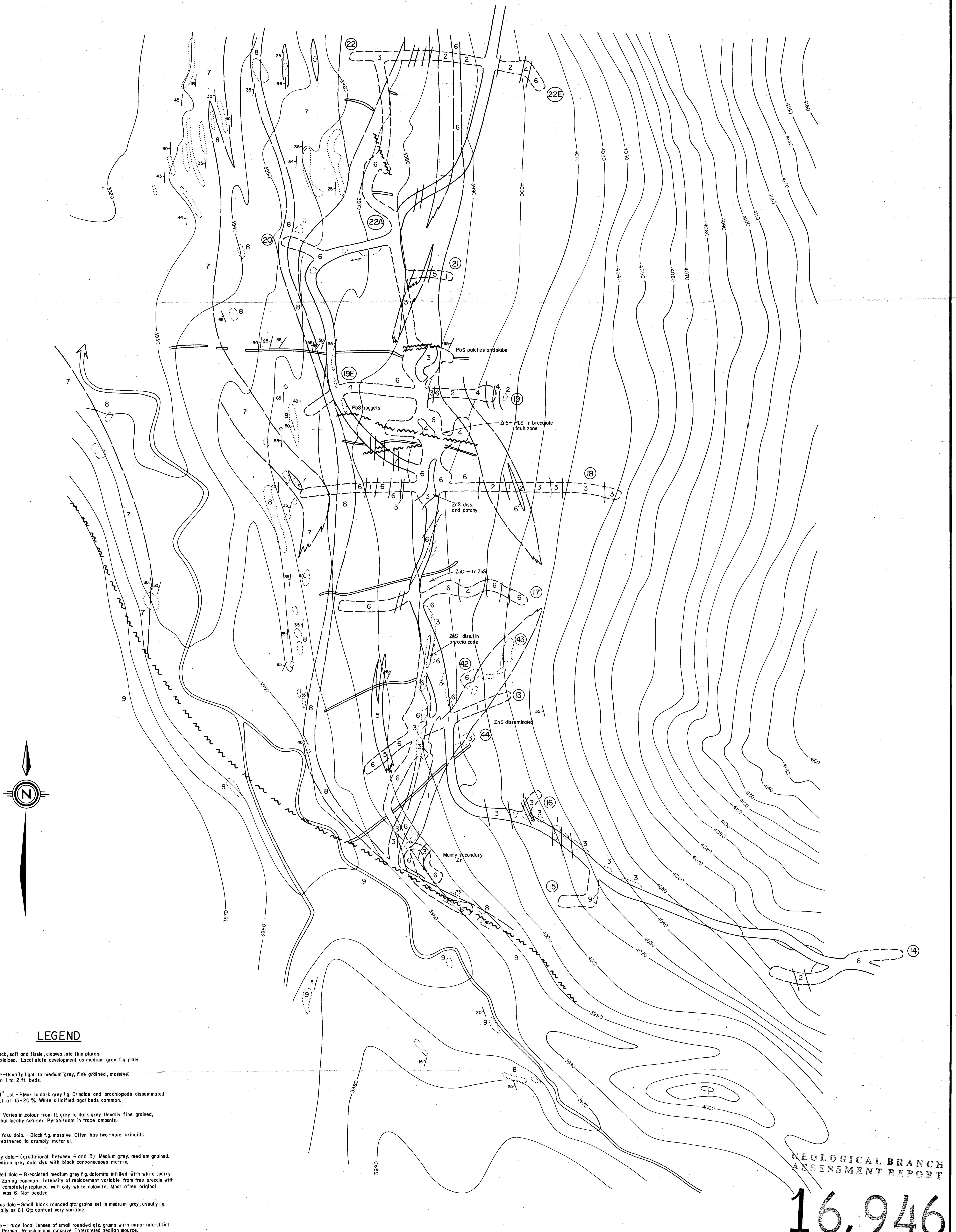
NINA PROPERTY
GENERAL
COMPILATION MAP

N.T.S. 93N/15

BEATY GEOLOGICAL LTD.

| SCALE 1:10,000 | DATE DECEMBER, 1986 |
|---|---|
| DRAWN L.S.M., J.W. | FIGURE No. 5 |

NOTE
MAP MODIFIED FROM DATA PROVIDED BY COMINCO LTD. AND OTHERS.




## LEGEND

| | |
|---|---|
| 9 | Shale - black, soft and fissle, cleaves into thin plates. Locally oxidized. Local slate development as medium grey f.g. platy |
| 8 | Limestone - Usually light to medium grey, fine grained, massive. Bedded in 1 to 2 ft. beds. |
| 7 | "Crinoidal" Lst. - Black to dark grey f.g. Crinoids and brachiopods disseminated throughout at 15-20 %. White silicified agal beds common. |
| 6 | Dolomite - Varies in colour from lt. grey to dark grey. Usually fine grained, massive but locally coarser. Pyrobituam in trace amounts. |
| 5 | Crinoidal foss. dolo. - Black f.g. massive. Often has two-hole crinoids. Locally weathered to crumbly material. |
| 4 | Coarse xly dolo. - (gradational between 6 and 3). Medium grey, medium grained. Often medium grey dolo. xlys with black carbonaceous matrix. |
| 3 | Impregnated dolo. - Brecciated medium grey f.g. dolomite infilled with white sparry dolomite. Zoning common. Intensity of replacement variable from true breccia with matrix to completely replaced with only white dolomite. Most often original rock type was 6. Not bedded. |
| 2 | Arenaceous dolo. - Small black rounded qtz. grains set in medium grey, usually f.g. dolo. (usually as 6) Qtz content very variable. |
| 1 | Sandstone - Large local lenses of small rounded qtz. grains with minor interstitial dolomite. Porous. Resistant and massive. Interpreted aeolian source. |
| | Argillite - Grey to green fine grained lensoid. |

Zn, Pb sulphides (disseminated, massive)

Trench outline

Outcrop

Fault

Bedding attitude

Old hand trench

(17) Trench number

NOTE.
MAP MODIFIED FROM DATA PROVIDED BY COMINCO LTD. AND OTHERS.



metres 10 0 10 20 30 40 50 60 70 metres

EQUINOX-DAREN JOINT VENTURE

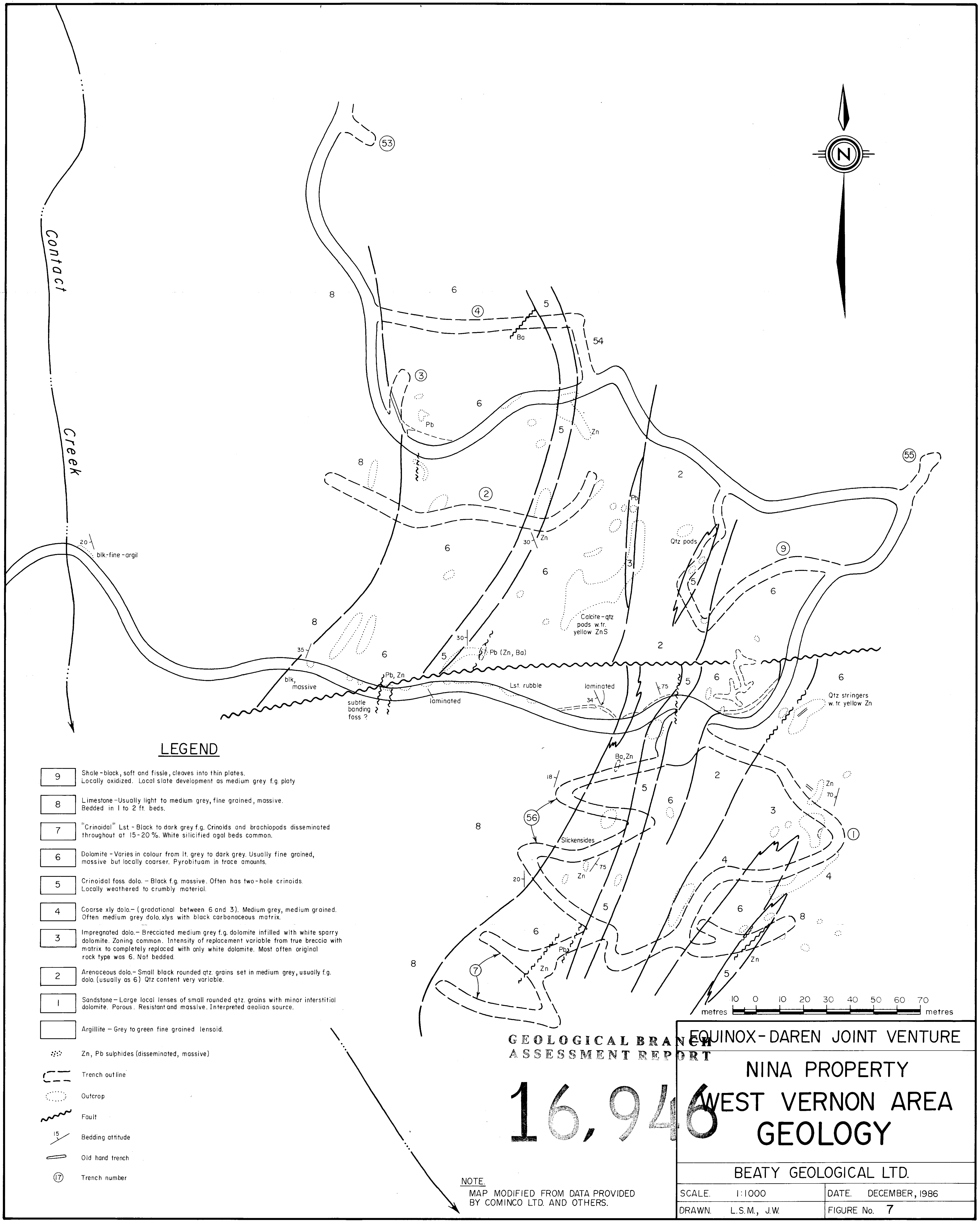
NINA PROPERTY

BIDDY AREA

GEOLOGY

BEATY GEOLOGICAL LTD.

| | | | |
|---|---|---|---|
| SCALE. | 1:1000 | DATE. | DECEMBER, 1986 |
| DRAWN. | L.S.M., J.W. | FIGURE No. | 6 |


Contact
Creek
53
4
3
2
9
55
54
56
7
1
8
6
5
Ba
Pb
Zn
2
3
5
6
Qtz pods
20
blk-fine-argil
30
Zn
Calcite-qtz
pods w.tr.
yellow ZnS
35
30
Pb (Zn, Ba)
Pb, Zn
blk,
massive
subtle
banding
foss ?
laminated
Lst. rubble
laminated
34
75
Qtz stringers
w. tr. yellow Zn
Ba, Zn
18
Slickensides
75
20
70
4
Zn
Pb
Zn
10 0 10 20 30 40 50 60 70
metres
metres
LEGEND
9 Shale - black, soft and fissle, cleaves into thin plates. Locally oxidized. Local slate development as medium grey f.g. platy
8 Limestone - Usually light to medium grey, fine grained, massive. Bedded in 1 to 2 ft. beds.
7 "Crinoidal" Lst - Black to dark grey f.g. Crinoids and brachiopods disseminated throughout at 15-20%. White silicified agal beds common.
6 Dolomite - Varies in colour from lt. grey to dark grey. Usually fine grained, massive but locally coarser. Pyrobituam in trace amounts.
5 Crinoidal foss. dolo. - Black f.g. massive. Often has two-hole crinoids. Locally weathered to crumbly material.
4 Coarse xly dolo.- (gradational between 6 and 3). Medium grey, medium grained. Often medium grey dolo. xlys with black carbonaceous matrix.
3 Impregnated dolo.- Brecciated medium grey f.g. dolomite infilled with white sparry dolomite. Zoning common. Intensity of replacement variable from true breccia with matrix to completely replaced with only white dolomite. Most often original rock type was 6. Not bedded.
2 Arenaceous dolo.- Small black rounded qtz. grains set in medium grey, usually f.g. dolo. (usually as 6) Qtz content very variable.
1 Sandstone - Large local lenses of small rounded qtz. grains with minor interstitial dolomite. Porous. Resistant and massive. Interpreted aeolian source.
Argillite - Grey to green fine grained lensoid.
Zn, Pb sulphides (disseminated, massive)
Trench outline
Outcrop
Fault
15
Bedding attitude
Old hand trench
17
Trench number
GEOLOGICAL BRANCH
ASSESSMENT REPORT
16,946
NOTE.
MAP MODIFIED FROM DATA PROVIDED
BY COMINCO LTD. AND OTHERS.
EQUINOX-DAREN JOINT VENTURE
NINA PROPERTY
WEST VERNON AREA
GEOLOGY
BEATY GEOLOGICAL LTD.
SCALE. 1:1000
DATE. DECEMBER, 1986
DRAWN. L.S.M., J.W.
FIGURE No. 7